

WHAT IS CLAIMED IS:

1. A light-emitting semiconductor device comprising:

an n-layer with n-type conduction of group III nitride compound semiconductor satisfying the formula $Al_{x3}Ga_{y3}In_{1-x3-y3}N$, inclusive of $x3=0$, $y3=0$ and $x3=y3=0$;

a p-layer with p-type conduction of group III nitride compound semiconductor satisfying the formula $Al_{x1}Ga_{y1}In_{1-x1-y1}N$, inclusive of $x1=0$, $y1=0$ and $x1=y1=0$;

an emission layer of group III nitride compound semiconductor satisfying the formula $Al_{x2}Ga_{y2}In_{1-x2-y2}N$, inclusive of $x2=0$, $y2=0$ and $x2=y2=0$;

a junction structure of said n-layer, said p-layer, and said emission layer being any one of a homo-junction structure, a single hetero-junction structure, and a double hetero-junction structure; and

wherein said emission layer is formed between said n-layer and said p-layer, and doped with both a donor and an acceptor impurity.

2. A light-emitting semiconductor device of claim 1, wherein said donor impurity is one of the group IV elements and said acceptor impurity is one of the group II elements.

3. A light-emitting semiconductor device of claim 2, wherein said donor impurity is silicon (Si) and said acceptor impurity is cadmium (Cd).

4. A light-emitting semiconductor device of claim 2, wherein said donor impurity is silicon (Si) and said acceptor impurity is zinc (Zn).

5. A light-emitting semiconductor device of claim 2, wherein said donor impurity is silicon (Si) and said acceptor impurity is magnesium (Mg).

6. A light-emitting semiconductor device of claim 1, wherein said emission layer exhibits any one of n-type conduction, semi-insulative and p-type conduction characteristics depending on concentration ratio of said donor impurity and said acceptor impurity doped thereto.

7. A light-emitting semiconductor device of claim 1, wherein said donor impurity is one of the group VI elements.

8. A light-emitting semiconductor device of claim 1, wherein the composition ratio of Al, Ga and In in

said n-layer, said p-layer and said emission layer is designed to meet each of the lattice constants of said layers to a lattice constant of an n^+ -layer of high carrier concentration.

9. A light-emitting semiconductor device comprising:

an n-layer with n-type conduction of group III nitride compound semiconductor satisfying the formula $Al_{x3}Ga_{y3}In_{1-x3-y3}N$, inclusive of $x3=0$, $y3=0$ and $x3=y3=0$;

a p-layer with p-type conduction of group III nitride compound semiconductor satisfying the formula $Al_{x1}Ga_{y1}In_{1-x1-y1}N$, inclusive of $x1=0$, $y1=0$ and $x1=y1=0$;

an emission layer with p-type conduction of group III nitride compound semiconductor satisfying the formula $Al_{x2}Ga_{y2}In_{1-x2-y2}N$, inclusive of $x2=0$, $y2=0$ and $x2=y2=0$ sandwiched between said n-layer and said p-layer; and

wherein said emission layer has a narrower band gap than those of said n-layer and said p-layer, and has p-type conduction.

10. A light-emitting semiconductor device of claim 9, wherein said emission layer is doped with magnesium (Mg), a donor impurity, and an acceptor impurity.

11. A light-emitting semiconductor device of claim 10, wherein said donor impurity is one of the group IV elements and said acceptor impurity is one of the group II elements.

12. A light-emitting semiconductor device of claim 11, wherein said donor impurity is silicon (Si) and said acceptor impurity is cadmium (Cd).

13. A light-emitting semiconductor device of claim 11, wherein said donor impurity is silicon (Si) and said acceptor impurity is zinc (Zn).

14. A light-emitting semiconductor device of claim 11, wherein said donor impurity is silicon (Si) and said acceptor impurity is magnesium (Mg).

15. A light-emitting semiconductor device of claim 11, wherein the composition ratio of Al, Ga, and In in said p-layer, said n-layer, and said emission layer is designed to meet each of the lattice constants of said layers to a lattice constant of an n^+ -layer of high carrier concentration.